

## CLAIMS

1. A stereoscopic image data structure for a stereoscopic display device that displays a stereoscopic image, with parallaxes being given in a horizontal direction but not given in a vertical direction,

the stereoscopic display device comprising:

a display unit that has a display face on which a parallax interleaved image for stereoscopic display is displayed, with pixels being arranged with a first horizontal pitch in the horizontal direction; and

a parallax barrier that has linear optical apertures disposed to face the display face and arranged with a second horizontal pitch in the horizontal direction, the optical apertures inclined from the vertical direction, the second horizontal pitch being equal to an integral multiple ( $n$ ) of the first horizontal pitch, the parallax barrier directing light rays emitted from pixels at horizontal intervals of  $n$  pixels as parallel light rays toward the viewing zone,

the stereoscopic image data structure comprising: a parallax component image data representing  $n$  or more parallax component images, each having accumulated pixels that cause the pixels to generate the parallel light rays in the same parallax direction in the viewing zone, and having different numbers of horizontal pixels,

wherein  $n$  combined images with the same numbers of vertical and horizontal pixels are a unit to be converted into a parallax interleaved image, the  $n$  combined images being formed by combining one or more parallax component images with parallax directions different from each other by  $n$ .

2. A method of recording stereoscopic image data for a stereoscopic display device that displays a stereoscopic image, with parallaxes being given in a horizontal direction but not given in a vertical direction,

the stereoscopic display device including:

a display unit that has a display face on which a parallax interleaved image for stereoscopic display is displayed, with pixels being arranged with a first horizontal pitch in the horizontal direction; and

a parallax barrier that has linear optical apertures disposed to face the display face and arranged with a second horizontal pitch in the horizontal direction, the optical apertures inclined from the vertical direction, the second horizontal pitch being equal to an integer multiple ( $n$ ) of the first horizontal pitch, the parallax barrier directing light rays emitted from pixels at horizontal intervals of  $n$  pixels as parallel light rays toward the viewing zone,

the method comprising:

preparing a parallax component image data representing  $n$  or more parallax component images, each having accumulated pixels that cause the pixels to generate the parallel light rays in the same parallax direction in the viewing zone, and having different numbers of horizontal pixels; and

recording  $n$  combined images with the same numbers of vertical and horizontal pixels as a unit to be converted into a parallax interleaved image, the  $n$  combined images being formed by combining one or more parallax component images with parallax directions different from each other by  $n$ .

3. The method of recording stereoscopic image data as claimed in claim 2, wherein:

each of the combined images is a parallelogram; and

the image data corresponding to one of the linear optical apertures is aligned in a vertical line in the combined images.

4. The method of recording stereoscopic image data as claimed in claim 2, wherein

each of the combined images has parallax component images stacked in  $m$  stages, each of the parallax component images having a vertical resolution that is  $1/m$  of a horizontal resolution.

5. The method of recording stereoscopic image data as claimed in claim 2, wherein each of the parallax component images are formed by perspective projection in vertical direction according to the predetermined viewing distance and by orthographic projection in horizontal direction.

6. The method of recording stereoscopic image data as claimed in claim 2, wherein each of the parallax component images are formed by perspective projection according to the predetermined viewing distance.

7. The method of recording stereoscopic image data as claimed in claim 2, wherein the  $n$  combined images are further combined so as to form an ultimate combined image to be recorded.

8. The method of recording stereoscopic image data as claimed in claim 7, wherein the ultimate combined image is formed by combining the combined images in such a manner that the combined images having adjacent parallax directions are adjacent to one another in the horizontal direction.

9. The method of recording stereoscopic image data as claimed in claim 8, wherein:

the ultimate combined image is formed by combining the combined images in such a manner that the combined images having adjacent parallax directions are adjacent to one another in the horizontal direction; and

the two combined images having the parallax directions at both ends of the  $n$  parallax direction close to the front face of the display face are disposed at both ends of the ultimate combined image.

10. The method of recording stereoscopic image data as claimed in claim 2, wherein the ultimate combined image is

formed by combining the combined images in the horizontal direction and the vertical direction, so as to form a tile-like format.

11. The method of recording stereoscopic image data as claimed in claim 2, wherein the ultimate combined image has the same numbers of vertical and horizontal pixels as those of the parallax interleaved image displayed on the display face at the time of stereoscopic display.

12. The method of recording stereoscopic image data as claimed in claim 7, wherein the ultimate combined image is formed as a rectangular-parallelepiped ray space defined by a ray space method.

13. The method of recording stereoscopic image data as claimed in claim 2, wherein the combined images or the ultimate combined image is irreversibly compressed and then recorded.

14. A reproducing method for a stereoscopic image, with parallaxes being given in a horizontal direction but not given in a vertical direction,

the stereoscopic display device including:

a display unit that has a display face on which a parallax interleaved image for stereoscopic display is displayed, with pixels being arranged with a first horizontal pitch in the horizontal direction; and

a parallax barrier that has linear optical apertures disposed to face the display face and arranged with a second horizontal pitch in the horizontal direction, the optical apertures inclined from the vertical direction, the second horizontal pitch being equal to an integer multiple ( $n$ ) of the first horizontal pitch, the parallax barrier directing light rays emitted from pixels at horizontal intervals of  $n$  pixels as parallel light rays toward the viewing zone,

the method comprising:

preparing a parallax component image data representing n or more parallax component images, each having accumulated pixels that cause the pixels to generate the parallel light rays in the same parallax direction in the viewing zone, and having different numbers of horizontal pixels;

recording n combined images with the same numbers of vertical and horizontal pixels, the n combined images being formed by combining one or more parallax component images with parallax directions different from each other by n; and

displaying a parallax interleaved image on the display face after converting the n combined images into the parallax interleaved image.

15. The reproducing method for a stereoscopic image as claimed in claim 14, wherein:

each of the combined images is a rectangular having the same aspect ratio as the parallax interleaved image; and

the conversion into the parallax interleaved image involves generation of pixel data of the parallax interleaved image through an interpolating process based on one or more pixels adjacent to each other in the horizontal direction in the combined images.

16. A reproducing method of a stereoscopic image, with parallaxes being given in a horizontal direction but not given in a vertical direction,

the stereoscopic display device including:

a display unit that has a display face on which a parallax interleaved image for stereoscopic display is displayed, with pixels being arranged with a first horizontal pitch in the horizontal direction; and

a parallax barrier that has linear optical apertures disposed to face the display face and arranged with a second horizontal pitch in the horizontal direction, the optical apertures inclined from the vertical direction, the second horizontal pitch

being equal to an integer multiple ( $n$ ) of the first horizontal pitch, the parallax barrier directing light rays emitted from pixels at horizontal intervals of  $n$  pixels as parallel light rays toward the viewing zone,

the method comprising:

preparing a parallax component image data representing  $n$  or more parallax component images, each having accumulated pixels that cause the pixels to generate the parallel light rays in the same parallax direction in the viewing zone, and having different numbers of horizontal pixels;

recording an ultimate combined image that is formed by combining  $n$  combined images having the same numbers of vertical and horizontal pixels, the  $n$  combined images being formed by combining one or more parallax component images with parallax directions different from each other by  $n$ ; and

displaying a parallax interleaved image on the display face after converting the ultimate combined image into the parallax interleaved image.

17. The reproducing method for a stereoscopic image as claimed in claim 16, wherein:

each of the combined images is a rectangular having the same aspect ratio as the parallax interleaved image; and

the conversion into the parallax interleaved image involves generation of pixel data of the parallax interleaved image through an interpolating process based on one or more pixels adjacent to each other in the horizontal direction in the combined images.

18. A computer-executable program for recording stereoscopic image data for a stereoscopic display device that displays a stereoscopic image, with parallaxes being given in a horizontal direction but not given in a vertical direction,

the program comprising instructions for:

preparing a parallax component image data representing  $n$  or more parallax component images, each having accumulated

pixels that cause the pixels to generate the parallel light rays in the same parallax direction in the viewing zone, and having different numbers of horizontal pixels; and

recording  $n$  combined images with the same numbers of vertical and horizontal pixels, the  $n$  combined images being formed by combining one or more parallax component images with parallax directions different from each other by  $n$ .

19. A computer-executable reproducing program for displaying a stereoscopic image, with parallaxes being given in a horizontal direction but not given in a vertical direction,

the program comprising instructions for:

preparing a parallax component image data representing  $n$  or more parallax component images, each having accumulated pixels that cause the pixels to generate the parallel light rays in the same parallax direction in the viewing zone, and having different numbers of horizontal pixels;

recording  $n$  combined images with the same numbers of vertical and horizontal pixels, the  $n$  combined images being formed by combining one or more parallax component images with parallax directions different from each other by  $n$ ; and

displaying a parallax interleaved image on a display unit after converting the  $n$  combined images into the parallax interleaved image.

20. A computer-executable reproducing program for displaying a stereoscopic image, with parallaxes being given in a horizontal direction but not given in a vertical direction,

the program comprising instructions for:

preparing a parallax component image data representing  $n$  or more parallax component images, each having accumulated pixels that cause the pixels to generate the parallel light rays in the same parallax direction in the viewing zone, and having different numbers of horizontal pixels;

recording an ultimate combined image that is formed by combining  $n$  combined images having the same numbers of

vertical and horizontal pixels, the  $n$  combined images being formed by combining one or more parallax component images with parallax directions different from each other by  $n$ ; and

displaying a parallax interleaved image on a display unit after converting the ultimate combined image into the parallax interleaved image.